

# इंटरनेट

# मानक

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“जानने का अधिकार, जीने का अधिकार”

Mazdoor Kisan Shakti Sangathan

“The Right to Information, The Right to Live”

“पुराने को छोड़ नये के तरफ”

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“Step Out From the Old to the New”

IS 10781 (1984): Reference Coupler for the Measurement of Hearing Aids Using Earphones Coupled to The Ear by Means of Ear Inserts [LITD 7: Audio, Video and Multimedia Systems and Equipment]



“ज्ञान से एक नये भारत का निर्माण”

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“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”



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Indian Standard



**SPECIFICATION FOR  
REFERENCE COUPLER FOR THE MEASUREMENT  
OF HEARING AIDS USING EARPHONES COUPLED  
TO THE EAR BY MEANS OF EAR INSERTS**

( IEC Title : IEC Reference Coupler for the Measurement  
of Hearing Aids Using Earphones Coupled to  
the Ear by Means of Ear Inserts )

**National Foreword**

This Indian Standard, which is identical with IEC Pub 126 ( 1973 ) ' IEC reference coupler for the measurement of hearing aids using earphones coupled to the ear by means of ear inserts', issued by the International Electrotechnical Commission ( IEC ), was adopted by the Indian Standards Institution on the recommendation of Acoustics Sectional Committee and approved by Electronics and Telecommunication Division Council.

In the adopted standard certain terminology and conventions are not identical with those used in Indian Standards, attention is especially drawn to the following :

Wherever the word 'Recommendation' appears referring to this standard, it should be read as 'Indian Standard'.

**Cross Reference**

In this Indian Standard, the following International Standard is referred to. Please read in its place the following Indian Standard :

<i>International Standard</i>	<i>Corresponding Indian Standard</i>
IEC Pub 50 ( 08 ) International electrotechnical vocabulary, electro-acoustics	IS : 1885 ( Part 3/Sec 6 ) - 1967 Electrotechnical vocabulary : Part 3 Acoustics, Section 6 Acoustical instruments ( Technically equivalent )

The technical committee responsible for the preparation of this standard has reviewed the provision of IEC Pub 126-1973 and has decided that they are acceptable for use in conjunction with this standard.

Acoustics Sectional Committee, LTDC 5 [ Ref : Doc : LTDC 5 ( 786 ) ]

Adopted 14 September 1984	© March 1985, ISI	Gr 4
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**1. Scope and object**

The object of this recommendation is to describe a coupler for loading the earphone with a specified acoustic impedance when determining the physical performance characteristics, in the frequency range 200 Hz to 5 000 Hz, of air-conduction hearing aids using earphones coupled to the ear by means of ear inserts, e.g. ear moulds or similar devices. The coupler described is a development of an earlier 2 cm<sup>3</sup> coupler.

The use of this coupler does not allow the actual performance of a hearing aid on a person to be obtained; however, the IEC recommends its use as a simple and ready means for the exchange of specifications and of physical data on hearing aids.

**2. Definition**

**2.1 Coupler**

A coupler is a cavity of predetermined shape and volume, which is used for the testing of earphones in conjunction with a calibrated microphone adapted to measure the pressure developed within the cavity (see IEC Publication 50 (08), International Electrotechnical Vocabulary, Electroacoustics).

**3. Construction**

**3.1 General**

The coupler shall be constructed of hard, non-porous and non-magnetic material and have a mass of at least 100 g, including the microphone. The coupler consists essentially of a cylindrical cavity whose reactance is that of a volume of 2 cm<sup>3</sup>. The base of the cylindrical cavity usually consists of the diaphragm of a microphone of high mechanical impedance, by means of which the sound pressure level in the coupler is measured.

The external diameter of the coupler should be kept as small as possible in order to minimize diffractional errors which might affect the measurements when the coupler has to be placed in a free sound field. The wall thickness, however, should not be less than 2 mm.

**3.2 The cavity**

The volume of the cavity shall have an effective value of 2 cm<sup>3</sup>  $\pm$  1 %: the dimensions, therefore, shall be corrected for any front cavity associated with the microphone, for the finite diaphragm impedance, the protective grid, etc. The correction may conveniently be made by adjusting the height of the cavity.

The diameter of the cylindrical cavity shall be not less than 18.0 mm and not greater than 21.0 mm.

A fine capillary tube, partially filled along its total length by a wire, shall connect the cavity to the external air in order to equalize the static pressure. This tube shall not affect the modulus of the impedance of the cavity by more than 1% in the frequency range 200 Hz to 5000 Hz.

### 3.3 *Calibrated pressure microphone*

The diameter of the free portion of the diaphragm of the calibrated pressure microphone shall not exceed the diameter of the cylindrical cavity. Within the frequency range 200 Hz to 5000 Hz, the magnitude of the mechanical impedance of the diaphragm shall be greater than 10 times the magnitude of the mechanical impedance of a 2 cm<sup>3</sup> cavity as seen from the diaphragm. If intermediate between 10 and 100 times this cavity impedance, the mechanical impedance of the diaphragm shall correspond to that of a pure stiffness in the above frequency range.

If it is necessary to use a microphone for which the diameter of the free part of the diaphragm is less than the diameter of the cavity of the coupler, the axes of the microphone and the cylindrical cavity shall coincide. If a probe tube microphone is employed, the base of the cavity shall be rigid, and the aperture of the probe shall be placed on the axis of the cylindrical cavity.

The general construction of the coupler and mounting of the microphone shall be such that the response of the microphone is not affected by spurious vibrations or by sound transmitted along abnormal paths.

### 3.4 *Connection of the hearing aid to the coupler*

#### 3.4.1 *Hearing aid with insert earphone*

Where possible, the ear insert shall be replaced by an ear mould substitute consisting essentially of a rigid tube, coaxial with the cavity, of length  $18 \pm 0.18$  mm and internal diameter  $3 \pm 0.03$  mm representing the tubular portion of an average ear mould.

The connection between the nub of the earphone and the ear mould substitute shall be made airtight by using a suitable wax or by some other sealing device, care being taken to avoid the inclusion of any extraneous cavities which might affect the performance of the earphone.

The principal features of an example of the IEC reference coupler with ear mould substitute and showing the connection of the earphone with the ear mould substitute are indicated in Figure 1, page 13. Other forms than the one illustrated may be used, provided that they conform to the above specifications.

If it is inappropriate to disconnect the ear insert from the receiver, the ear insert shall be connected directly to the entrance of the cylindrical cavity and shall be coaxial with it. A suitable wax or other device shall be used to ensure an airtight seal, care being taken to avoid the inclusion of any extraneous cavities which might affect the performance of the earphone.

#### 3.4.2 *Hearing aids of the behind-the-ear type and hearing spectacles*

The hearing aid with its acoustic outlet attachment (e.g. elbow and flexible connecting tube of behind-the-ear instruments or nub and flexible connecting tube of hearing spectacles), shall be connected to the 2 cm<sup>3</sup> coupler with ear mould substitute as described in Sub-clause 3.4.1 by means of a coupling device of rigid material, having the same internal diameter as the nominal diameter of the end of the acoustic outlet attachment  $\pm 2\%$  and a length of  $5 \pm 0.1$  mm. The connection between the coupling device and the ear mould substitute shall be made airtight by using a suitable

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**IEC Pub 126 ( 1973 )**

wax or by some other sealing device, care being taken to avoid the inclusion of any extraneous cavities which might affect the performance of the hearing aid.

The material, length and internal diameter of the connecting tubing between the hearing aid and the coupling device shall conform to the manufacturer's specifications.

On the hearing aid side, the flexible connecting tube shall be connected to the nub of a hearing spectacle or to the elbow, if any, of a behind-the-ear instrument. The flexible tube shall not be connected directly to the behind-the-ear-type of hearing aid if this aid is intended to be used with an elbow.

Unless otherwise specified, the length of the flexible tube measured from the end of the elbow or from the end of the nub to the entrance of the 3 mm diameter rigid tube of the ear mould substitute shall be  $25 \pm 1$  mm.

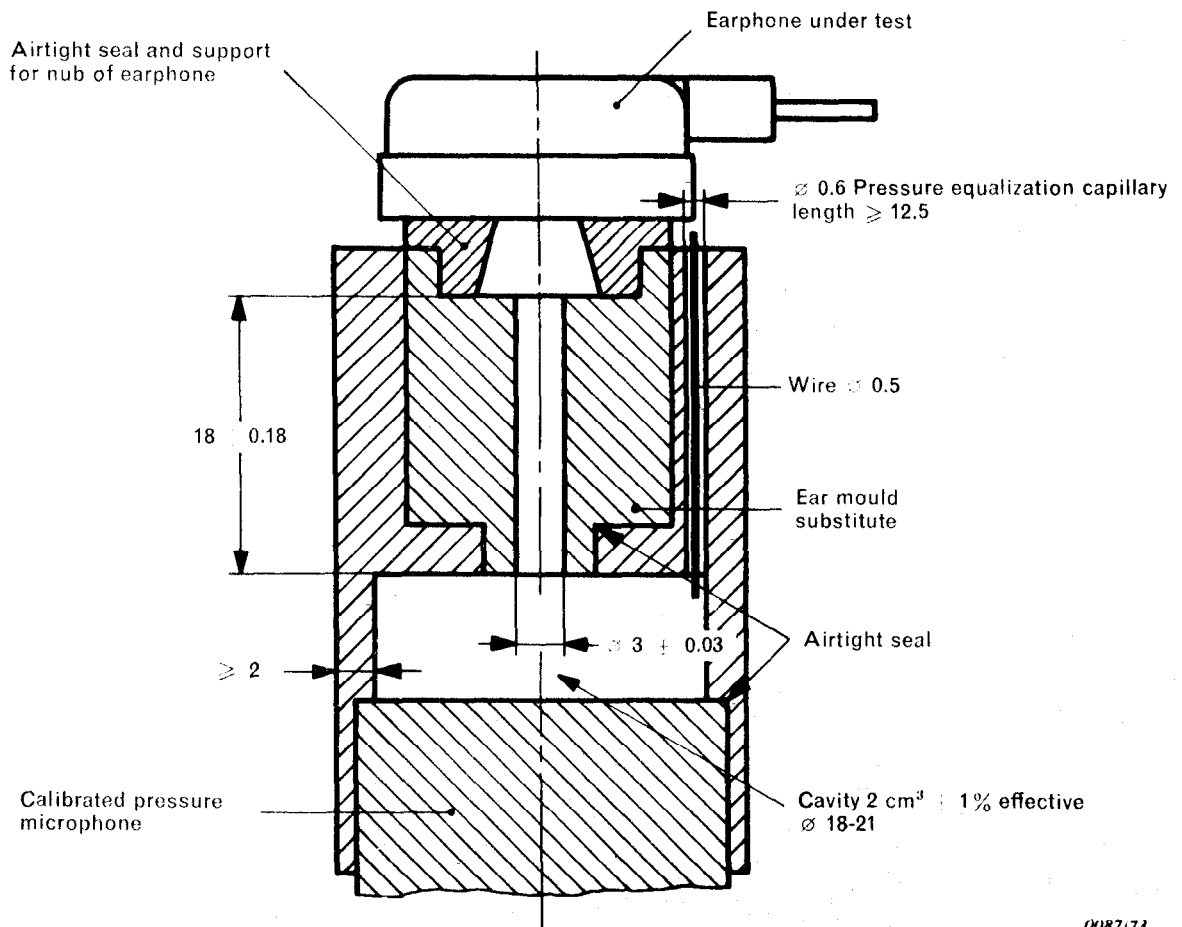
The principal features of an example of the IEC reference coupler with ear mould substitute and coupling device, showing the connection arrangement for a behind-the-ear hearing aid are indicated in Figure 2, page 15. In the example the internal diameter of the coupling device is chosen to be 2 mm in accordance with the tubing most commonly used. Other forms than the one illustrated may be used, provided that they conform to the above specifications.

*Note.* — The manufacturer's specifications for the dimensions of the tubing should be in accordance with the average conditions found in practical use of the hearing aid.

If for some unusual reason, it is impossible to simulate the average conditions of practical use with the ear mould substitute specified above in the coupler, an appropriate different system may be used if fully described.

### **3.4.3 *Hearing aids of the in-the-ear type***

The hearing aid shall be connected directly to the 2 cm<sup>3</sup> volume cavity of the coupler as indicated in Figure 3, page 17. The connection between the hearing aid and the coupler shall be made airtight by using a suitable wax or by some other sealing device, care being taken to avoid the inclusion of extraneous cavities which might affect the performance of the hearing aid.



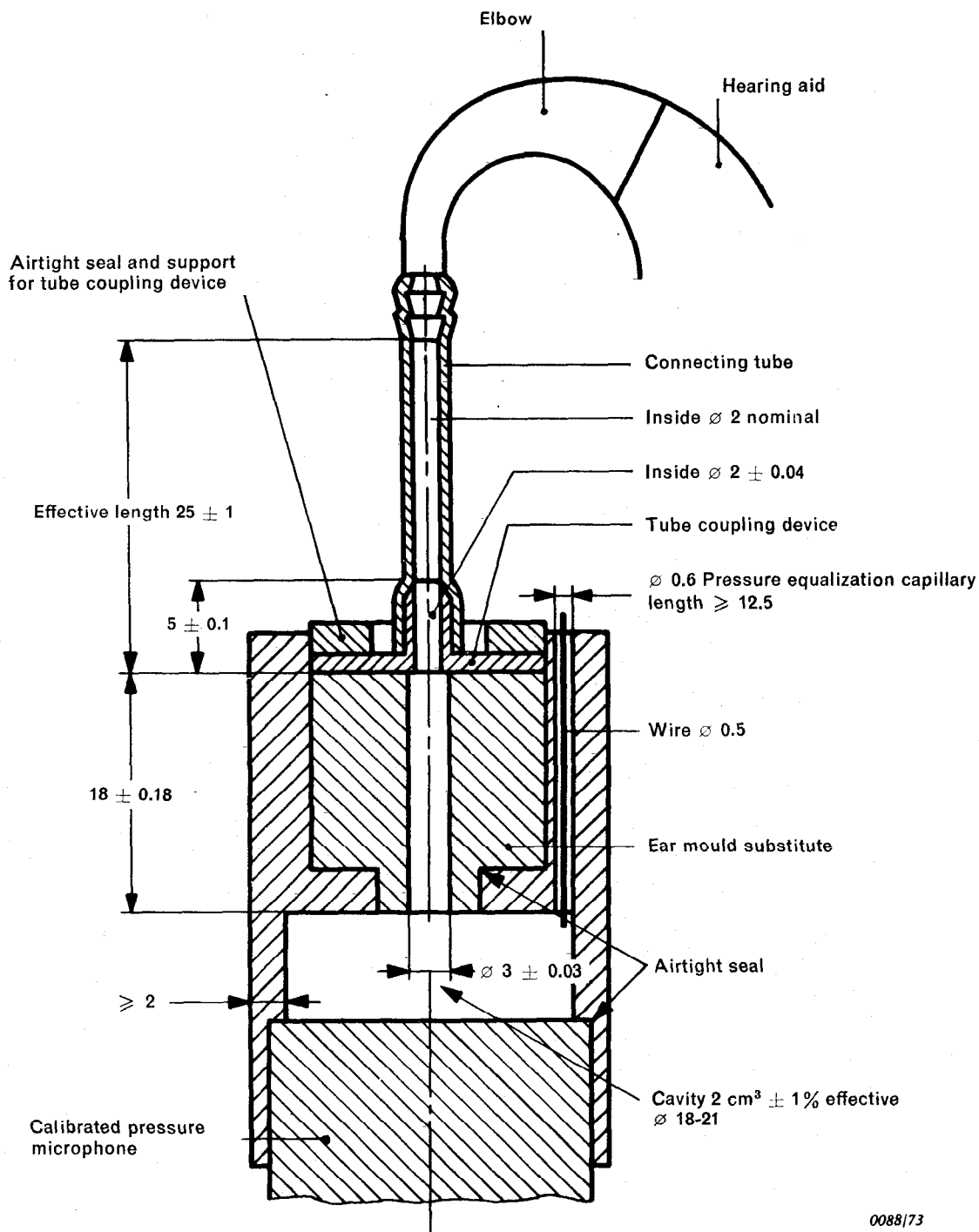
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Dimensions in mm

Note. — This diagram is only intended as a schematic representation, illustrating the principle of construction.

FIG. 1. — Coupling of an insert earphone to the coupler.





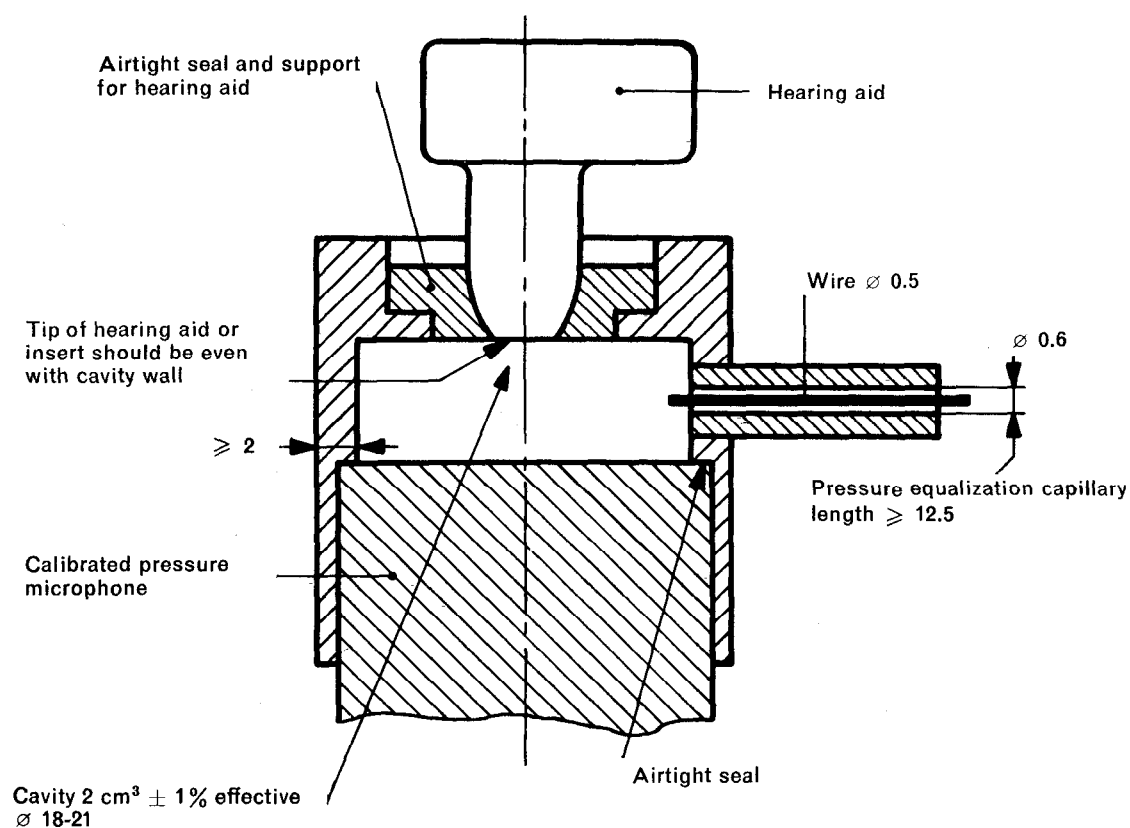
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Notes 1. — This diagram is only intended as a schematic representation, illustrating the principle of construction.

2. — The effective length of the tubing and the inside diameters of both the tubing and the coupling device (which are to be equal) should be as shown above unless otherwise specified by the manufacturer in order to meet the average conditions found in practical use of a particular hearing aid.

Dimensions in mm

FIG. 2 — Coupling of a behind-the-ear type of hearing aid to the coupler.



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*Dimensions in mm*

*Note.* — This diagram is only intended as a schematic representation, illustrating the principle of construction.

FIG. 3. — Coupling arrangement for an in-the-ear type of hearing aid.